Technical Notes

• NATIONAL SOCIETY FOR BUSINESS BUDGETING •

Alvin H. Weiss, Editor • 4400 W. National Ave. • Milwaukee 14, Wisconsin

VOL. I -- NO. 4 MARCH 1953

EDITORIAL COMMENTS

This entire issue is devoted to the theme "Long Range Planning and Forecasting in the Extractive Industries." Three segments of the extractive industry are represented in the four articles which follow; namely, oils, minerals, and non-ferrous metals. These companies represent a fair cross-section of the extractive industry. We should also like to recall to the reader's attention the very excellent article on the closely related subject of capital expenditures budgeting by Mr. H. G. Hill, Jr. of the Atlantic Refining Company which appeared in the February issue of Technical Notes.

While this series of articles cites the forecasting practices of companies engaged in the extractive industries, the techniques outlined should be of interest to budget men in virtually every field of business. The importance of this type of careful foresight is certainly not restricted to the extractive industries alone.

Perhaps the most startling observation that can be made after reading the articles which follow is the fact that there is such wide divergence in the scope of the forecasting practices of each company. Some make an exhaustive study of potential markets and other factors which may affect the future operations of the business, while others have found it desirable to make forecasts relatively simple in scope. All agree that long-range forecasting provides their organization with a planned program of stated objectives on goals.

NEW YORK CHAPTER.

LONG RANGE METAL PRICE FORECAST PROCEDURE

By Mr. H. G. Stringham, Assistant to the Comptroller

AMERICAN SMELTING AND REFINING COMPANY

Because of the volatile nature of non-ferrous metal prices and the resulting impact of these prices on the business of this Company, a long range forecast procedure has been established to gather information pertinent to metal prices and thereby provide a basis for forecasts of prices as they affect long range planning for mine development, plant construction, metal sales policy and ore and scrap buying policy. This write-up briefly outlines the procedures followed.

The American Smelting and Refining Company is the world's largest smelter and refiner of non-ferrous metals with plants in the United States, Mexico, Australia

and England. In addition to custom tonnage treated by the plants, mining and milling operations located in the United States, Mexico, Canada, Peru, Nicaragua, Australia and Saudi Arabia supply an increasing part of the ores and concentrates handled.

Lead, zinc, copper, gold and silver are the principal refined metals produced, but in addition by-products, such as bismuth, cadmium, antimony, arsenic, sulfuric acid, selenium, tellurium, indium, platinum, palladium, etc. are also resultant products of the operation.

The Company's Secondary metals division with plants in the United States and Canada produces an extensive number of aluminum, brass, copper, lead, magnesium and zinc alloys, solders, babbits, anodes and fabricated lead products.

Forecasts for copper, lead and zinc prices are prepared at least annually for use by the Metal Price Committee in establishing the official 5-year forecast prices to be used for planning purposes.

The direct and quick reaction of metal prices to factors of supply and demand, dictates that the forecast be based on such factors. Before attempting to estimate the potential supply and demand, it is first necessary to consider items such as the following and make assumptions as to their most probable action over the ensuing 5-year period:

1. International Relations - particularly war or prospects of war.
2. World Trade - strikes, political upheavals, transportation difficulties.
3. U. S. Industrial Activity - measured by Federal Reserve Board Index of Industrial Production. The reason for use of this index will be indicated in the comments following which concern demand factors.
4. Foreign Industrial Activity - including results of U.S. aid.
5. Tariffs.
6. Value of Dollar.
7. Gold and Silver prices - U. S. prices being Government fixed, by-product credits resulting from gold and silver contained in the copper or lead, and consequently the cost of the copper or lead is affected by any governmental action on prices.
8. Government stockpile or subsidy policy.
9. Nationalistic tendencies in foreign countries - government controlled economies tend to keep in production even uneconomic mines.
10. Substitution.

The forecast follows the procedure of estimating world demand for a metal and then determining the approximate price required to cover the production cost of that much metal. Various statistical series are available to indicate U. S. consumption. A close correlation has been found to exist between consumption and the Federal Reserve Board Index of Industrial Production. Therefore, by projecting the estimated level of this index, as commented upon above concerning assumptions to be considered, the approximate demand is indicated five years hence. This forecast is checked by estimating consumption by major users.

Foreign demand is estimated primarily on the basis of forecasts by the Company's Sales Department.

Supply data is based on a tabulation of the normal productive capacity of each of the world's major mines, both current and estimated five years into the future. An indication of each mine's break-even point (cost per pound of metal) is also computed. These obviously very general figures are compiled primarily from published financial reports of the companies involved.

The productive capacity is recapitulated to show the metal available at each 2¢ increment of production cost. By comparing the estimated demand with this recapitulation and assuming such demand will be met by the lowest cost producers, the cost of the highest increment necessary to meet the demand is found. The cost of this highest increment gives a general indication of an approximate price range which might be expected and certainly one below which the price cannot be expected to fall below for any extended period.

This indicated price is checked against projections of the B.L.S. Index of wholesale commodity prices. While metal prices have been more volatile than the Index, a certain degree of correlation has been found to exist.

In conclusion, it should be stated that the many deficiencies in basic data available and technique used quite obviously make the results far from precise. However, the continuous tabulation of data and refinement in procedure do provide a rather sound base from which the Metal Price Committee can arrive at reasonably accurate conclusions, certainly far better than without such information.

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LONG RANGE PLANNING AND FORECASTING

By G. R. Westby, Assistant to Treasurer
CERRO DE PASCO CORPORATION

The Cerro de Pasco Corporation has been a member of the non-ferrous metals industry for fifty years. It is chartered under the laws of the State of New York and is managed by American interests. Up to the present time all of its properties are located in the Republic of Peru, high in the Andes Mountains.

The Corporation presently operates five deep shaft mines, four of which are primarily copper-lead-zinc producers. The fifth supplies coal needs. Refined metals are produced from the Corporation's ore bodies as well as from the ores and concentrates purchased from independent mines. With the exception of small quantities of bismuth-based, low melting point alloys, Cerro de Pasco does not engage in the manufacture of finished or semi-finished metal products.

MARKETS AND PRODUCTS

Markets for Cerro's products are international in scope with only relatively minor quantities sold in Peru. The products available for sales are:

Zinc
Lead
Copper
Silver
Gold
Bismuth
Antimony, Selerium, Cadmium, etc.
Copper, Sulphate and Zinc Sulphate
Sulphuric Acid

INDUSTRIAL PROCESSES

The industrial processes in which the Corporation engages are those common to the non-ferrous metals industry. A general statement of the activities with a brief explanation of each follows.

EXPLORATION -- Ore bodies are the sources of raw materials that eventually result in the production of refined metals. The life of an ore body is not eternal. Eventually the time comes when the ore is mined out or the remaining material does not contain sufficient metal values to justify further extraction. At this time it would seem desirable to define an ore as it is known in the mining industry. An ore is a material containing sufficient metal values to warrant processing to the stage of a refined metal. It is obvious that measures must be taken to maintain the feed of subsequent productive steps and what is more important is that new sources of ore must be located before the older ones are exhausted. This briefly is the function of exploration.

MINING -- This step can be divided into two categories, development and extraction. Development are those measures taken by specialized mine crews to direct the activities of the extractors. They locate the vein, determine its direction and prepare the working area. It is important that ore and not worthless rock be transported horizontally to the shaft and vertically up the shaft if hauling costs are to be kept at a minimum. Extraction are those activities relating to the physical removal of ore from nature's resting place to the next stage of the productive cycle.

CONCENTRATING -- With the exception of some ores which are simple in geologic composition and extremely high in metal values, most of the products of the mines go to a concentrator which is a mill designed to remove worthless material and to produce a concentrate of high metallic content. In the case of a complex ore, copper, lead and zinc concentrates are produced by selective flotation.

SMELTING -- Direct smelting ores and concentrates are smelted in which process many of the impurities are drawn off as a slag. The molten metal of approximately 85% purity is cast in thick plates called anodes.

REFINING -- The anodes are suspended in an electrolyte between thin sheets of pure metal. An electric current is introduced to the anodes and taken off from the thin sheets or cathodes. During the process pure metal transfers to the cathodes and the remaining impurities drop to the bottom of the cell. These so-called impurities in the form of a slime are sent to a separate refinery for the removal of gold, silver, bismuth, etc.

SELLING -- With the exception of relatively insignificant quantities of metals sold locally in Peru, the Corporation has appointed the American Metal Company Ltd. as exclusive selling agency for refined metals.

SUBSIDIARY ACTIVITIES -- These include the operation of a standard gauge railroad, townsites with hospitals, commissaries and other social services, and a three million acre tract of land for the raising of livestock and vegetables for the needs of sixteen thousand employees.

The Capsule presentation of the Corporation as to its products and processes having been completed, it is now time to outline long range planning and forecasting in Cerro de Pasco. This will be done on a "how" and "why" basis.

HOW

At the outset it must be remarked that the precision and exactness of cost

behavior that most manufacturers in this country have been able to chart for their respective products as they pass from stage to stage in the industrial process is largely missing in the non-ferrous metals industry. This does not mean that we are not cost conscious, it merely acknowledges the fact that fixing standard costs in most phases of the business is impractical.

A ten year period has been determined as the optimum time interval for long range planning purposes and within this span the first five years are closely watched.

Prices and price movements are the most important factors that determine the extent of forward planning. If the reward, or the promise of it, for the effort expended is not forthcoming, a new venture should be, and is, abandoned. The time interval between the inception of the idea and getting the plant ready to produce ranges between five and seven years. It is apparent then that much importance is placed on price movements for this and subsequent periods.

Estimating prices and their movements is however but one facet of the problem. What physical quantity is going to be available at these assumed prices is another. Mining engineers by drilling and seismiographic sounding estimate the ore body into known ore and probable ore. The known ore divided by the extractive capacity of the equipment to be used will give some idea as to the life of the mine. Later, but before the known ore becomes used up, the exploration crews must give some idea of the extent of ore in the classification formerly known as probable. The redesignation will determine the extension of the life of the mine beyond that indicated by the originally known ore reserve.

So far all that has been accomplished is the determination of what the physical output of the Corporation will be for the future period under assumed optimum conditions. Consideration must now be given to:

Costs
Profits
Encroachments on profits

Direct costs of each productive process are taken at the average of the available six months prior to the time the long range forecast is made. This time period has been used because in the first place it is long enough to level out any accounting adjustments that might possibly distort a shorter period. It is also short enough so as not to minimize the effect of rising costs if that be the case.

Indirect operating expense is regarded as a fixed expense and not as a function of volume. It is estimated on an annual basis and included as such for each year of the forecast.

It is obvious that the person responsible for the forecast has limited technical knowledge and in order to establish a plan that has credence, the best information must be obtained. Key personnel for this purpose are;

Vice President and Manager of Operations
Plant Superintendents
Resident Mining Engineer
Resident Metallurgist

It is at this point that a ten year forecast is made. It must be remembered that this is based on Corporation factors only, i.e. supply and cost, company-wise.

If there were no external factors this would be as far as one would have to go with respect to profit and loss planning. Unfortunately there are external factors that are both difficult to time and equally difficult to ascertain as far as magnitude is concerned.

Business cycles are reviewed because we are all interested in "riding the peaks and missing the valleys."

Labor relations with respect to the Corporation and its big customers such as the storage battery makers, the brass mills, the glavanizers, etc. are given consideration.

An evaluation of the political scene in Peru and the United States must be made. The Republic of Peru has a liberal mining code. Will it be sustained?

Tarriff barriers exist in the United States with respect to lead and zinc. Will the rates be increased on Cerro de Pasco metal?

Finally there is the aura of complexity that surrounds non-ferrous metals through international trade. Standard grades have been prescribed for each metal and within each grade there is practically no difference in the product of each producer. London has recently returned to pre-eminence as a trading center for lead and zinc necessitating revisions in the price schedules for these metals.

The impact of the external factors mentioned in the preceding paragraphs must be given effect on the Corporation's long term forecast by superimposing them over the Corporate plan and adjusting where necessary and feasible.

WHEN TO ADJUST

So far attention has been directed to the broad mechanics of long range forecasting. The question that naturally arises at this time is when does one adjust the plan for changed conditions? An inherent danger must be recognized and that is the striving for perfection and preciseness at the cost of losing sight of the purpose. In the first place, the projection is the result of the best estimates of the best qualified people plus the results of past short-term history plus innumerable intangibles. It is evident that the outcome has got to be at a variance with actual results. The redeeming feature is that the elements of the plan are known so that the causes of deviation may be readily determined for future reference. When the forecast has lost its effectiveness as a result of a number of changes in basis conditions it must be altered. This is an altogether different thing from continuously changing the plan for the purpose of change alone. In the non-ferrous metals industry nicety of composition and presentation runs a poor second to establishing a basis upon which future financial decisions must rest.

WHY

Why is a long range forecast necessary? The answer can only be predicated by a review of the financial responsibilities of the Corporation. Following a pattern common in most companies, the Corporation is actively engaged in expanding its productive facilities. To repeat, in the mining industry the time period between the inception of the idea and its fruition is long. It is necessary to establish, at least on an estimated basis, the desirability of the project upon completion as it seems today.

Closely allied to capital requirements is the availability of cash to pay for the new assets. If the wherewithal is apparently not going to be generated out of current operations, some advantage can be gained from the fact that management will have sufficient time to approach the bankers to secure additional funds at the best terms available.

When undergoing a capital expansion program, sight is sometimes lost of the current working capital requirements. The forecast will give some idea of the condi-

tions to be overcome so that plans can be made for securing adequate working capital for the period under consideration.

The nightmare of inventories and their adjustments are well known. The future plan with its highlighted critical points can do much to bring about an orderly approach to the inventory problem.

In the mining industry, as in many others, good financial management is reflected in the integrity of the firm's securities. This is particularly important in the attraction of new venture capital and in the case of property acquisitions when the consideration is the exchange of securities.

The last "why" that will be considered is one which does not merit consideration by itself, but rather in conjunction with one or more of those previously mentioned. It is the requirement issued by bankers, either of a private or public character upon the issuance of a line of credit.

In the final analysis, be the case that of Cerro de Pasco, its associates in the non-ferrous metals industry, its counterparts in other associated or unassociated businesses, the long range forecast represents a present evaluation of future prospects. Its physical aspect is a sheet or innumerable sheets of paper and of itself means absolutely nothing. It is at best a tool of and not a substitute for alert, skilled and interpretative management.

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LONG RANGE PLANNING AND FORECASTING

By Mr. P. A. Lawrence, Manager of Control

FREEPORT SULPHUR COMPANY

Freeport Sulphur is a producer of crude sulphur, or brimstone. Sulphur mining operations utilizing the Frasch process are conducted at several plants located in the Gulf Coast area of Texas and Louisiana. In addition, the company has other, smaller mineral interests including oil, nickel, potash and pyrites. Dollar sales in 1952 were around $38 million: total assets amount to $53 million. The company is one of the two major domestic sulphur producers.

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The detailed annual forecast for all phases of the company's activities is prepared each year. This forecast, representing an estimate of earnings and balance sheet items, is based upon a sales forecast submitted by the sales department, production cost estimates prepared at the mining properties and other expenditures anticipated for the period as estimated by various personnel responsible for the different activities of the company. Supplemental budgets are developed for such activities as capital additions, research and exploration, and administrative, selling and general expense. As part of the annual projection, there is also prepared a month-to-month estimate of net earnings and of cash requirements. The basic annual forecast is subject to review and modification at the end of the first six months period. Cash projections are exposed to current review.

The annual forecast is not approved in total although certain of the supplemental budgets are specifically approved and become the basis of the year's authorized expenditures for these activities. Requested additions to approved budgets may be submitted for authorization as special items throughout the year. The estimate of annual production costs as included in the annual projection is used solely for financial planning; approval of production activities is obtained through monthly budgets.

Monthly operating budgets are submitted by the properties and are based on a standard budget, which represents the anticipated normal operating and routine repair costs for the scheduled production rate, and on estimates of costs for the additional work required in excess of the standard for the month's activities. Each month's production cost budget for the mining properties is approved in advance by the management.

The month's actual costs are compared with the monthly budgets and significant variations are accounted for by the departmental superintendents. In turn, the individual property superintendents and budget departments advise management of the reason for variations and of methods suggested for reducing costs for the various programs when they are out of line with the authorizations. Top management is furnished a monthly analysis and a yearly analysis which reviews actual operations in comparison with the projections as developed in the annual forecast. The impact and effect on operations of major developments are reviewed, particularly in relation to earnings and to the outlook for earnings.

The annual forecast, the monthly budgets and the various related analyses often form the basis for -- or suggest the direction of -- longer range planning and forecasts. The latter activities follow a less formalized pattern.

Long-range planning is regularly engaged in for practically all of the company's activities but principally with respect to markets, earnings, capital expenditures, financial policies and research and exploration. The period covered is not fixed and may range as far ahead as 5 to 10 years.

The long-range planning process basically involves the interpretative study of (a) markets in the various consuming industries (b) the supply situation (c) productive capacity and necessary capital requirements and (d) earnings and financial policies. Major studies on the different problems are made from time to time as a basis for long-range plans; these studies and the results thereof are under constant review and revision in order to assure the updating of all such plans in line with current developments.

This company is engaged primarily in the production and distribution of one commodity, crude sulphur, and virtually the entire organization is focused toward this product. Accordingly, it has not been found necessary to establish a department for the specific purpose of long-range planning. There is one staff department devoting its full attention to long-range market studies, but the results are available for use more as applicable research than as definitive planning. In general, responsibility for long-range planning is on a vertical basis, with the various executives within the company developing programs for the individual activities for which they are responsible. Because of product concentration and the relatively small organization, long-range plans in actual practice tend to represent the joint efforts of the production, sales, financial and research groups. Services of outside consultants are utilized in specialized fields such as those relating to technical aspects of end markets and the projections of economic conditions during the period for which plans are formulated. Ultimate coordination of long-term planning activities is achieved by a top level Executive Committee.

CAPITAL EXPENDITURES BUDGETING AND CASH FORECASTING

By Mr. E. R. Mueller, Manager
Head Office Accounting Department

SHELL OIL COMPANY

ORGANIZATION

Shell Oil Company is an integrated company from exploring for new sources of crude oil to the marketing of refined products. Business is conducted by the operation of six major exploration and production areas, five refineries and 18 marketing divisions, each administered through a local office. Management responsibility and authority is on a decentralized basis and each unit is fully integrated, with final nation-wide administration and executive control retained in the Head Office in New York. On the financial side, our organization consists of a Vice President-Finance, assisted by a Controller and Treasurer and their respective staffs in the Head Office, and a Treasury Manager and staff in each of the 29 decentralized offices.

OVER-ALL PLANNING

Producing, refining, transportation, marketing and administrative expenses are not budgeted in the strict sense of the word, although we do make annual estimates of these expenses. Our experience has been that these expenses can be controlled satisfactorily and with less cost and paper work by "on-the-spot" control of operations and delegations of authority within limits at the field level. We do, however, budget certain selected items of expense such as exploration for new crude oil resources, research, advertising, memberships and donations, and these budgets are reviewed periodically as the need arises.

We depend most for over-all planning on estimates of earnings and cash position, and strict budgeting of capital expenditures. Estimates of revenues and expenses originating at the field office level are prepared in the last quarter of each year for the succeeding calendar year, and are revised quarterly.

From this information, a company-wide profit estimate is made, and by applying estimated capital expenditures, our cash position is determined. In addition to the earnings and cash position estimates for the oncoming year, earnings and cash balances are projected for two additional years based on certain internal and external factors related to the year's operations just completed. These factors include estimated variations in sales volume and prices, refining capacity, raw material production and capital expenditures.

CAPITAL EXPENDITURES

In the oil business, the most flexible financial aspect is found in capital expenditures. If properly controlled, capital expenditures may be quickly curtailed or even shut off, as conditions require. That is why Shell budgets this type of expenditure more formally than any other phase of its business.

Our experience with long-range budgeting of capital expenditures has not been as good as we wish it could have been because of fast changes in the oil business. We rely chiefly on a firm working budget for one year only, and project expenditures for two additional years primarily for the purpose of forecasting our cash position. Well

in advance of the beginning of each calendar year the President acquaints each operating vice president with the fundamental economic and financial conditions which will govern the preparation of the capital expenditure budget for the oncoming year. The vice presidents, in turn, transmit these conditions to branch office executives who are responsible for developing budget estimates of capital requirements within the prescribed policies. After each operating vice president has reviewed with branch office executives the detailed justification of their individual budgets, a consolidation of estimates is made, and the vice presidents meet with the President and the Vice President-Finance for the purpose of analyzing the budgets in the light of availability of funds and of operating needs arising from competitive requirements, necessity for replacement or expansion.

The final evaluation of the budget is performed by the Board of Directors. The budget is then released to the operating vice presidents who, in turn, pass along to the various branch offices that part of the budget which has been allocated to them. Amendments to the budget, occasioned by changing conditions, may be made currently and follow the same channels as does the budget itself.

The budget alone, however, is not sufficient authority for operating officials to make capital commitments. Before expenditures may be made for budgeted projects, separate authorizations are required in accordance with limits of delegated authority. There are three phases to our capital budget: appropriation, commitment and expenditure. Management is informed monthly by means of regular reports from all branches as to budget amounts committed and spent so that management at all times knows how much of the budget is not yet committed and can be cancelled should it become necessary.

It is apparent from this summary that Shell has found it desirable to maintain the simplest practical control of what is ordinarily called budgeting. We believe that the money controls are best exercised not by procedures but by people.